IBM AIX

HP StorageWorks Disk Array XP operating system configuration guide

XP48
XP128
XP512
XP1024
XP12000

fifth edition (August 2004)

part number: A5951-96043

This guide describes the requirements and procedures for connecting the XP family of disk arrays to an IBM AIX system and configuring the new disk array for operation with AIX.

Printed in the U.S.A.

HP StorageWorks Disk Array XP Operating System Configuration Guide: IBM AIX

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Contents

About this guide

This manual describes the requirements and procedures for connecting the XP family of disk arrays to an IBM server and configuring the new disk array for operation with the AIX operating system.

Intended audience

This guide is intended for system administrators who have knowledge of the following topics:

- Data processing concepts
- Direct access storage device subsystems and their basic functions
- Disk arrays and RAID technology
- Operating system commands and utilities

Disk arrays

Unless otherwise noted, the term *disk array* refers to these disk arrays:

HP Surestore Disk Array XP512
HP Surestore Disk Array XP48
HP StorageWorks Disk Array XP128
HP StorageWorks Disk Array XP1024
HP StorageWorks XP12000 Disk Array

Related documentation

HP provides the following related documentation:

- *HP StorageWorks Disk Array XP128: Owner's Guide*
- *HP StorageWorks Disk Array XP1024: Owner's Guide*
- *HP StorageWorks XP12000 Disk Array: Owner's Guide*

For information about operating system commands and third-party products, refer to the manufacturer's documentation.

Conventions

This guide uses the following text conventions.

Figure 1	Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target.
www.hp.com	Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target.
literal	Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles.
variable	Italic type indicates that you must supply a value. Italic type is also used for manual titles.
`input/output`	Monospace font denotes user input and system responses, such as output and messages.
Example	Denotes an example of input or output. The display shown in this guide may not match your configuration exactly.
[ ]	Indicates an optional parameter.
{ }	Indicates that you must specify at least one of the listed options.
|	Separates alternatives in a list of options.

HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

http://h18006.www1.hp.com/storage/arraysystems.html

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP storage website

For the most current information about HP StorageWorks XP products, visit the support website. Select the appropriate product or solution from this website:

http://h18006.www1.hp.com/storage/arraysystems.html

For information about product availability, configuration, and connectivity, consult your HP account representative.

HP authorized reseller

For the name of your nearest HP authorized reseller, you can obtain information by telephone:

United States	1-800-345-1518
Canada	1-800-263-5868
Or contact:	www.hp.com

Revision history

May, 1999	First release.
September, 1999	Open-8 emulation added.
January, 2000	Content revised and reorganized.
April, 2000	Revised and expanded.
June, 2000	Added support for XP512. Reorganized and revised.
March, 2001	Added OPEN-E emulation mode. Added appendixes C, D, E, F, and glossary.
November, 2003	Changed brand name to StorageWorks. Added support for OPEN-L and OPEN-V. Changed CVS to VSC. Minor updates throughout.
August 2004	Updated to support XP12000. Reorganized and completely updated all text.

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Installation

Installation of the HP StorageWorks Disk Array XP is performed by your HP service representative and you. The HP service representative installs the disk array and formats the disk devices. You configure the host server for the new devices with assistance from the HP service representative.

Features and requirements

The disk array and host have the following features and requirements.

- HP StorageWorks disk arrays:

  XP48: Up to 48 drives from 72 GB to 8.7 TB, 24 FC ports

  XP128: From 8 to 128 drives for up to 18 TB, 48 FC ports

  XP512: Up to 512 drives from 72 GB to 93 TB, 48 FC ports

  XP1024: From 8 to 1024 drives for up to 149 TB, 64 FC ports

  XP12000: Up to 1152 drives for up to 165 TB, 128 FC ports
- IBM RS/6000 series, POWERstation, POWERserver, or SP series
- IBM AIX operating system with current OS patches
- superuser (**root**) login access to the system
- Host Bus Adapters (HBAs): Install adapters and all utilities and drivers. Refer to the adapter documentation for installation details.
- *(Recommended)* HP StorageWorks Command View XP with LUN management feature or Remote Control with the LUN Configuration Manager XP option for configuring disk array ports and paths.
- *(Recommended)* HP StorageWorks Secure Manager XP: Allows the host to access only array devices for which it is authorized.
- Other available XP Software (some may not apply to your system):
  HP StorageWorks Business Copy XP
  HP StorageWorks Continuous Access XP
  HP StorageWorks Continuous Access Extension XP
  HP StorageWorks Auto LUN XP
  HP StorageWorks Data Exchange XP
  HP StorageWorks Resource Manager XP
  HP StorageWorks RAID Manager XP
  HP StorageWorks Cache LUN XP
  HP StorageWorks Auto Path XP
  HP StorageWorks Cluster Extension XP
  HP StorageWorks Performance Advisor XP software

Fibre Channel interface

The XP48, XP128, XP512, XP1024, and XP12000 disk arrays support these 1 Gbps and 2 Gbps Fibre Channel interfaces:

- Short-wave non-OFC (open fiber control) optical interface
- Multimode optical cables with SC or LC connectors
- Public or private arbitrated loop (FC-AL) or fabric direct attach
- Fibre Channel switches

Even though the interface is Fibre Channel, this guide uses the term "SCSI disk" because disk array devices are defined to the host as SCSI disks.

Device emulation types

The disk arrays support the following device emulation types:

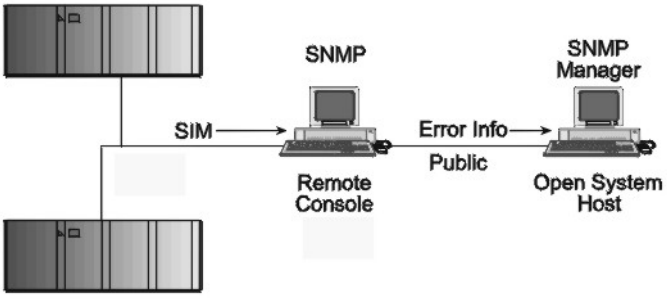
- **OPEN-*x* devices:** OPEN-x logical units represent disk devices. Except for OPEN-V, these devices are based on fixed sizes. OPEN-V is a user-defined size. Supported emulations include OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-L, and OPEN-V devices.
- **LUSE devices (OPEN-*x**n):** Logical Unit Size Expansion (LUSE) allows you to combine 2 to 36 OPEN-x devices to create expanded LDEVs larger than standard OPEN-*x* disk devices. For example, an OPEN-x LUSE volume created from ten OPEN-x CVS volumes is designated as OPEN-x*10.
- **CVS devices (OPEN-x CVS):** Volume Size Configuration (VSC) defines custom volumes (CVS) that are smaller than normal fixed-sized logical disk devices (volumes). (OPEN-V is a CVS-based custom disk size that you determine. OPEN-L does not support CVS.)
- **LUSE (expanded) CVS devices (OPEN-x*n CVS):** LUSE CVS combines CVS devices to create an expanded device. This is done by first creating CVS custom-sized devices and then using LUSE to combine from 2 to 36 CVS devices. For example, if three OPEN-9 CVS volumes are combined to create an expanded device, this device is designated as OPEN-9*3-CVS.

Failover

The disk arrays support many standard software products that provide host, application, or I/O path failover and logical volume (storage) management.

SNMP configuration

The disk arrays support standard Simple Network Management Protocol (SNMP) for remotely managing the disk array from the host. The SNMP agent on the remote console PC or Command View can provide status and Remote Service Information Message (R-SIM) reporting to the SNMP manager on the host for up to eight disk arrays. To configure the SNMP manager on the host, refer to the operating system documentation.



RAID Manager command devices

RAID Manager manages Business Copy (BC) and/or Continuous Access (CA) operations from a server host. To use RAID Manager with BC or CA, you must use Command View or LUN Configuration Manager to designate at least one LDEV as a command device. Refer to the Command View or LUN Configuration Manager user guide for information about how to designate a command device.

Installation procedures

The HP representative and you perform the following procedures:

1. "Install and configure the disk array" on page 16
   - "Setting the System Option Modes"
   - "Configuring the Fibre Channel ports"
   - "Setting the Host Mode for the disk array ports"
2. "Install and configure the host" on page 20
   - "Loading the OS and software"
   - "Installing and configuring the HBAs"
   - "Clustering and Fabric zoning"
   - "Fabric zoning and LUN security for multiple operating systems"
3. "Connect the disk array" on page 25
   - "Defining the paths"
   - "Verifying disk array device recognition"
4. "Configure disk array devices" on page 28
   - "Changing the device parameters"
   - "Assigning the new devices to volume groups"
   - "Creating the Journaled File Systems"
   - "Mounting and verifying the file systems"

Install and configure the disk array

The HP service representative performs the following tasks:

- Assembling hardware and installing software
- Loading the microcode updates
- Installing the channel adapters (CHAs) and cabling
- Installing and formatting devices

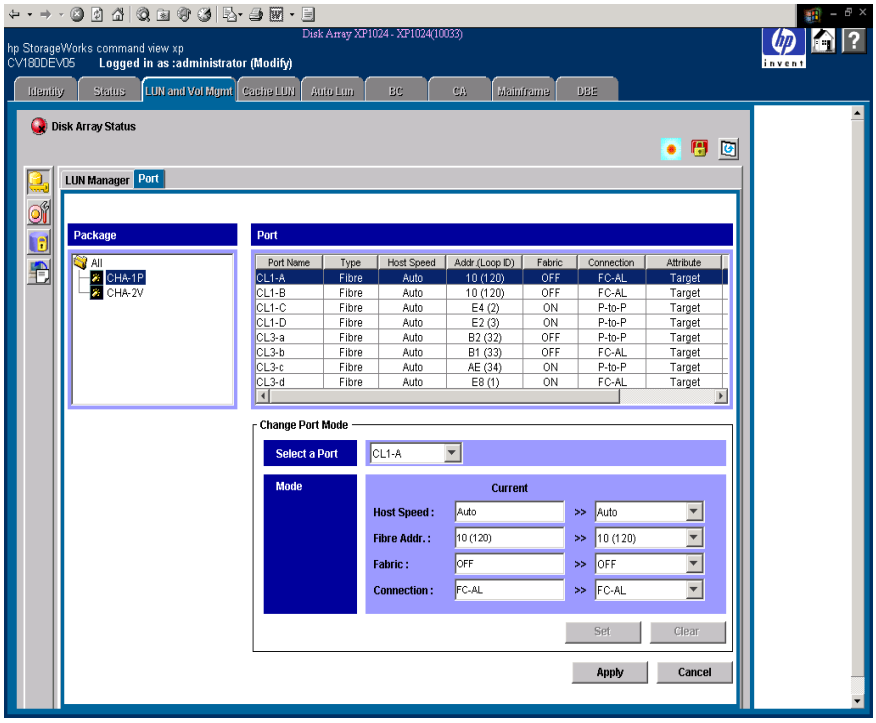
You perform the additional tasks below. If you do not have Command View or LUN Configuration Manager, your HP service representative can perform these tasks for you.

Setting the System Option Modes

The HP representative sets the System Option Mode(s) based on the operating system and software configuration of the host.

Configuring the Fibre Channel ports

Configure the disk array Fibre Channel ports by using Command View (shown) or the Fibre Parameter window in LUN Configuration Manager. Select the settings for each port based on your storage area network topology. Use switch zoning if you connect different types of hosts to the array through the same switch.

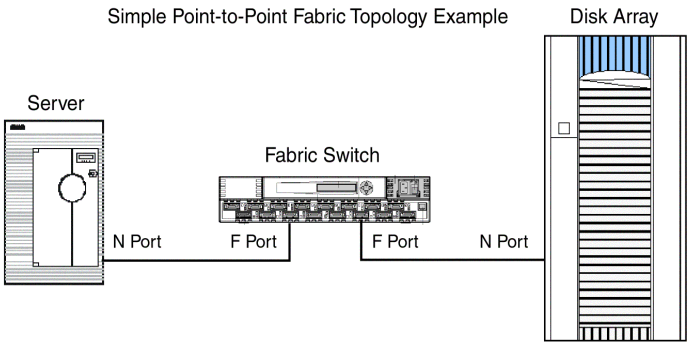


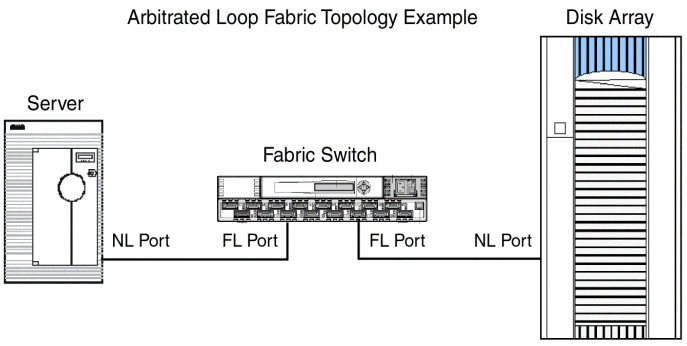
Fibre Address

In fabric environments, the port addresses are assigned automatically. In arbitrated loop environments, you set the port addresses by selecting a unique arbitrated loop physical address (AL-PA) or loop ID for each port.

Fabric and Connection parameter settings

You can set each array port to FABRIC ON or OFF with connections of POINT-TO-POINT or FC-AL as shown in the following table and figures. For detailed topology information, refer to the *HP StorageWorks SAN Design Reference Guide* on the hp.com website.

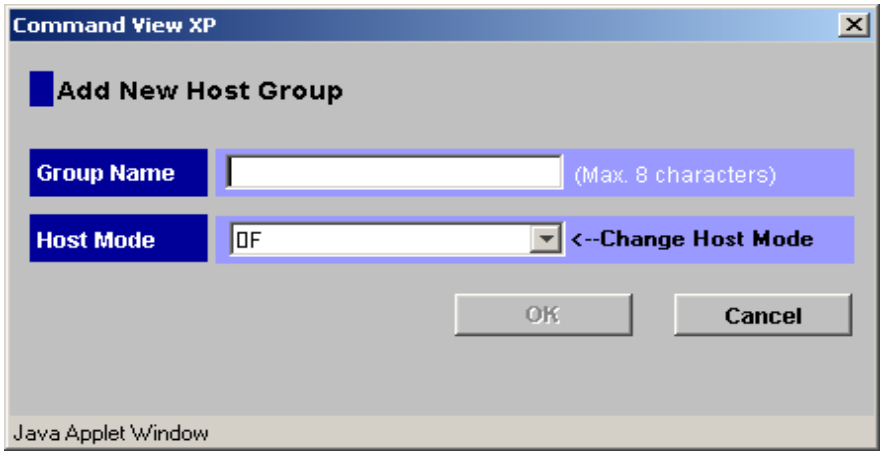




Fabric Parameter	Connection Parameter	Provides
ON	FC-AL	FL-port (public arbitrated loop)
ON	Point-to-Point	F-port (fabric port)
OFF	FC-AL	NL-port (private arbitrated loop)
OFF	Point-to-Point	Not supported

Setting the Host Mode for the disk array ports

The disk array ports have Host Modes that you must set depending on the host you use. After the disk array is installed, use Command View (shown) or LUN Configuration Manager to set the Host Mode for each port.



The host mode for AIX is **OF**.

Install and configure the host

Install and configure the host and host bus adapters (HBAs) that connect the host to the disk array.

Loading the OS and software

Follow the manufacturer's instructions to load the operating system and software onto the host. Load all OS patches and configuration utilities supported by HP and the HBA manufacturer.

Installing and configuring the HBAs

Install and configure the host bus adapters using the HBA manufacturer's instructions.

Supported HBAs

Supported HBAs include the IBM FC6227, IBM FC6228, and IBM FC6239.

To check whether the drivers are installed:

Example (FC 6227)

1. Use the **lslpp** command to display the drivers currently installed on the system.

   ```
   # lslpp -l | grep df1000f7
   ```

2. Check the list for the required two drivers:

   For the IBM FC 6227 HBA, the following drivers are required:

   devices.pci.df1000f7

   devices.fcp.disk

   If the drivers are displayed, you do not need to install the drivers.

   If the drivers are not displayed, install the drivers by using the **installp** command or SMIT.

Example (FC 6228)

1. Use the **lslpp** command to display the drivers currently installed on the system.

   ```
   # lslpp -l | grep df1000f9
   ```

2. Check the list for the required two drivers:

   For the IBM FC 6227 HBA, the following drivers are required:

   devices.pci.df1000f9

   devices.fcp.disk

   If the drivers are displayed, you do not need to install the drivers.

   If the drivers are not displayed, install the drivers by using the **installp** command or SMIT.

To check the firmware level:

The HBA should have the proper version of firmware installed.

Example

1. Use the **lsdev** command to display the device object.

   ```
   # lsdev -Cc adapter
   ```

2. Use the **lscfg** command to display the firmware level.

   ```
   # lscgfg -vl fcsX
   ```

   fcsX is the fiber devids object (typically fcs0). The field “Devices Specific.(Z9)” shows the installed firmware revision of the HBA.

To install the drivers using the AIX command line:

1. Insert the IBM drivers CD.
2. Use the **installp** command to install the drivers.

Example

```
# installp -a -dlpfc.installp all
```

3. Use the **lslpp** command to verify that the drivers are installed on the system.
4. Configure the new devices by rebooting the system with the **shutdown –r** command or using the **cfgmgr** command to run Configuration Manager.

To install the drivers using SMIT:

1. Insert the IBM drivers CD.
2. Start SMIT.

Example

```
# smit
```

The System Management screen appears.

3. Select Install Additional Software.
4. Select Input Device / Directory For Software and press F4 to select device.
5. Select Software To Install and press F4 to display a list of software.
6. Select the drivers needed using F7.

   You can use the slash (“/”) to search for the components in the list.

Example

HBA FC 6227 requires these drivers:

devices.pci.df1000f7

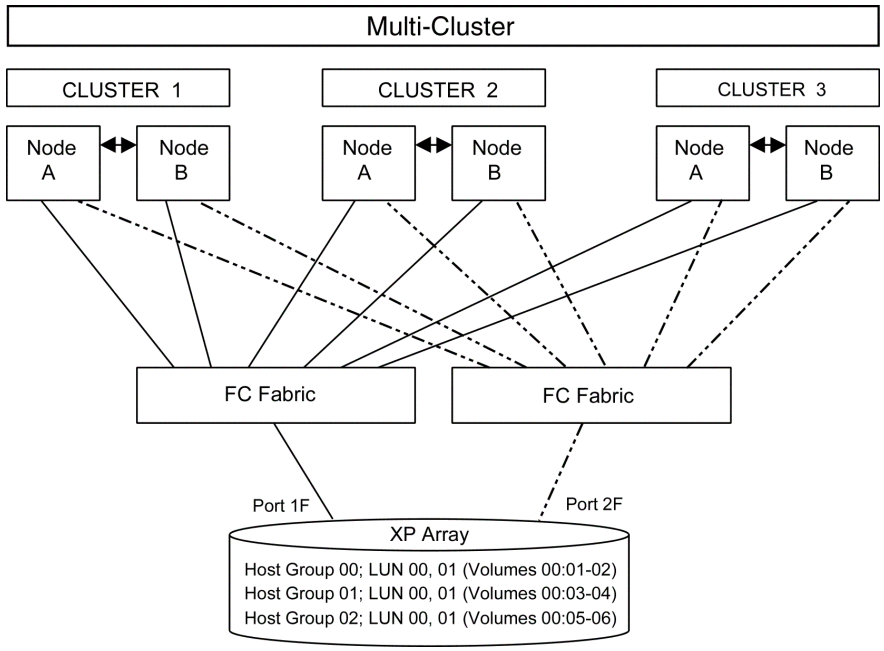
devices.fcp.disk

7. Press **Enter**.

   Wait for status to change from RUNNING to OK.
8. Check installation summary result (SUCCESS).
9. Press **F10**.
10. Use the **smit devinst** command to configure the devices.

Clustering and Fabric zoning

If you plan to use clustering, install and configure the clustering software on the servers. Clustering is the organization of multiple servers into groups. Within a cluster, each server is a node. Multiple clusters compose a multi-cluster environment. The following example shows a multi-cluster environment with three clusters, each containing two nodes. The nodes share access to the disk array.



Within the Storage Area Network (SAN), the clusters may be homogeneous (all the same operating system) or they may be heterogeneous (mixed operating systems). How you configure LUN Security and fabric zoning depends on the operating system mix and the SAN configuration.

Fabric zoning and LUN security for multiple operating systems

By using appropriate zoning and LUN security, you can connect multiple clusters of various operating systems to the same switch and fabric:

- Host zones must contain only homogeneous operating systems.
- Storage port zones may overlap if more than one operating system needs to share an array port.
- Heterogeneous operating systems may share an XP array port if you use Secure Manager and set the appropriate host group and mode; all others must connect to a dedicated XP array port.
- Use Secure Manager for LUN isolation when multiple hosts connect through a shared array port. Secure Manager provides LUN security by allowing you to restrict which LUNs each host can access.

Environment	OS Mix	Fabric Zoning	LUN Security
Standalone SAN (non-clustered)	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple hosts connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Clustered SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Multi-Cluster SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	

Connect the disk array

Connect the disk array to the host as follows:

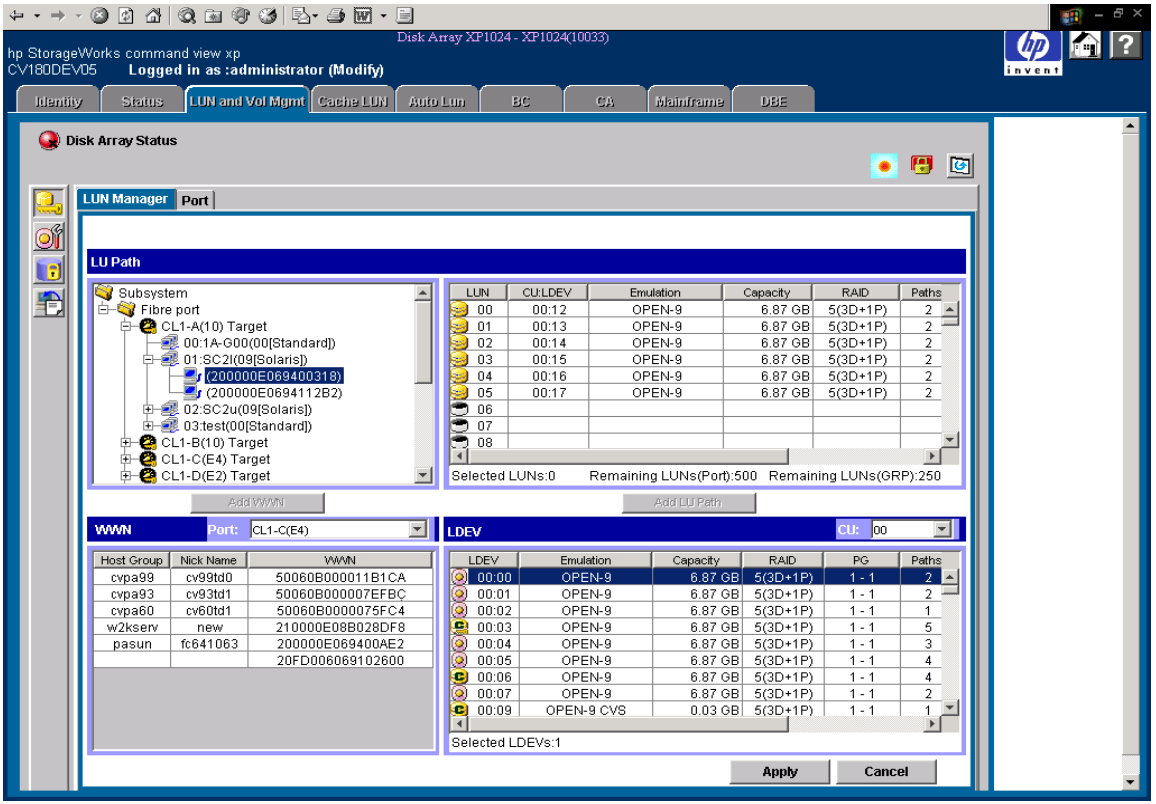
1. The HP service representative verifies operational status of the disk array channel adapters, LDEVs, and paths.
2. The HP representative connects the Fibre Channel cables between the disk array and the fabric or host.
3. Verify the ready status of the disk array and peripherals.

Defining the paths

Use Command View (shown) or LUN Configuration Manager to create paths (LUNs) between hosts and volumes in the disk array, also called LUN mapping. LUN mapping includes these tasks:

- Configuring ports
- Setting LUN security
- Creating host groups by operating system and setting their host modes
- Assigning host bus adapter WWNs to host groups.
- Mapping volumes to host groups (by assigning LUNs).

For details, see the Command View or LUN Configuration Manager guide. HP recommends that you note LUNS and their ports, WWNs, nicknames, and LDEVs for later use in verifying host and device configuration.



Verifying disk array device recognition

Verify that the host recognizes the disk array devices:

1. Log into the host as an administrator (root).
2. If the disk array LUNs are defined after the IBM system is powered on, issue a **cfgmgr** command to recognize the new devices.
3. Use the **lsdev** command to display system device data and verify that the system recognizes the newly installed devices.

   ```
   # lsdev -Cc disk
   ```

   The devices are listed by device file name. All new devices should be listed as "Available." If they are listed as "Define," you must do more configuration before they can be used.

Example (Fibre Channel)

```
#lsdev -Cc disk
hdisk0  Available  10-60-00-5, 0  16 Bit SCSI Disk Drive
hdisk1  Available  10-60-00-6, 0  16 Bit SCSI Disk Drive
```

The example shows that Device hdisk0 is installed on bus 60 and has TID=5 and LUN=0.

4. Record the device file names for the new devices. You will use this information in changing the device parameters.
5. Use the **lscfg** command to find out the AIX disk device's corresponding array LDEV designation.

Example

lscfg –vl hdisk3

In this example, the emulation type, LDEV number, CU number and array port designation should all be displayed for disk device hdisk3.

Configure disk array devices

Configure the disk array devices in much the same way you would configure any new disk on the host. Creating scripts to configure all devices at once may save you considerable time.

Changing the device parameters

When the device files are created, the system sets the device parameters to the system default values. You may need to change a few of those values for each new OPEN-*x* device:

- read/write (R/W) timeout value
- queue depth
- queue type

The recommended queue depth settings may not provide the best I/O performance for your system. You can adjust the queue depth setting to optimize the I/O performance of the disk array.

Type	Parameter Name	Default Value	Required Value for Disk Array
SCSI	Read/write time-out	30	60
	Queue depth	1	2 (For LUSE devices use 2 for each LUN. For example, if one LUSE device contains 8 LUNs, use 2 × 8 = 16 for the queue depth.)
	Queue type	None	Simple

Type	Parameter Name	Default Value	Required Value for Disk Array
Fibre Channel	Read/write timeout	30	60
	Queue depth	Before 52-38-*xx*	Use 2 if exclusively OPEN-*x* volumes are mapped to the SCSI/FC port. Use 8 if exclusively LUSE volumes are mapped to the SCSI/FC port. Use 2 if an intermix of LUSE and OPEN-*x* volumes is mapped to the SCSI/FC port. **Use 8 if an intermix of LUSE and OPEN-*x* volumes is mapped for dummy LU (I-7135-Emu).**
		52-40-*xx* to 52-44-*xx*	Number of volumes × queue-depth ≤256 AND queue-depth ≤8
		52-45-*xx* or later	Number of volumes × queue-depth ≤256 and queue-depth ≤32
	Queue type	None	Simple

To show the device parameters using the AIX command line:

At the command line prompt, enter **lsattr -E -l hdisk*x*,** where **hdisk*x*** is the device file name.

Example

```
# lsattr –E -l hdisk2
```

To change the device parameters using the AIX command line:

1. Change the parameters as follows:

   To change the R/W timeout parameter, enter:

   chdev –l hdisk*x* –a rw_timeout='60'

   To change the queue depth parameter, enter:

   chdev –l hdisk*x* –a queue_depth='*x*'

where *x* is a value from the above table.

To change the queue type parameter, enter:

chdev –l hdisk*x* **–a q_type='simple'**

Example This example changes the queue depth for device **hdisk3**:

```
# chdev -l hdisk3 -a queue_depth='2'
```

2. Verify that the parameters for all devices were successfully changed.

Example

```
# lsattr -E -l hdisk3
```

3. Repeat these steps for each OPEN-*x* device on the disk array.

Tip The **lsattr** command also shows other useful information, such as LUN ID of the mapped LDEV, worldwide name of the disk array FC port, and N-Port ID.

Another useful command for determining the slot position and port worldwide name of the HBA is the **lscfg –v –l hdisk***x* command.

To change the device parameters using SMIT:

1. Start SMIT. *(Optional)* For an ASCII session, use the **smit –C** command.

Example

```
# smit
```

The System Management screen appears.

2. Select **Devices**.

Example

```
                        System Management

Move cursor to desired item and press Enter.
  Software Installation and Maintenance
  Software License Management
  Devices
  System Storage Management (Physical & Logical Storage)
  Security & Users
Communications Applications and Services
  Print Spooling
  Problem Determination
  Performance & Resource Scheduling
```

```
  System Environments
  Processes & Subsystems
  Applications
  Using SMIT (information only)
```

The Devices screen appears.

3. Select **Fixed Disk**.

   The Fixed Disk screen appears.

4. Select **Change/Show Characteristics of a Disk**.

   The Disk screen appears.

5. Select the desired device from the Disk menu.

   The Change/Show Characteristics of a Disk screen for that device is displayed.

Example

```
                Change/Show Characteristics of a Disk
Type or select values in entry fields.
Press Enter AFTER making all desired changes.
[MORE...4]
  Status
  Location
  Parent adapter
  Connection address
  Physical volume IDENTIFIER
  ASSIGN physical volume identifier            no
  Queue DEPTH                                 [2]
  Queuing TYPE                                [simple]
  Use QERR Bit                                [yes]
  Device CLEARS its Queue on Error            [no]
  READ/WRITE time out value                   [60]
  START unit time out value                   [60]
  REASSIGN time out value                     [120]
  APPLY change to DATABASE only                no
```

6. Enter the correct values for the read/write timeout value, queue depth, and queue type parameters. Press **Enter** to complete the parameter changes.

7. Repeat these steps for each OPEN-*x* device on the disk array.

Assigning the new devices to volume groups

Assign the new devices to volume groups, using the AIX system's Logical Volume Manager (accessed from within SMIT). This operation is not required when the volumes are used as raw devices.

To assign a device to a volume group:

1. Start SMIT. *(Optional)* For an ASCII session, use the **smit –C** command.

Example

```
# smit
```

The System Management screen appears.

2. Select **System Storage Management (Physical & Logical Storage)**.

Example

```
                        System Management
Move cursor to desired item and press Enter.

  Software Installation and Maintenance
  Software License Management
  Devices
  System Storage Management (Physical & Logical Storage)
  Security & Users
Communications Applications and Services
  Print Spooling
  Problem Determination
  Performance & Resource Scheduling
  System Environments
  Processes & Subsystems
  Applications
  Using SMIT (information only)
```

3. Select **Logical Volume Manager**.

Example

```
   System Storage Management (Physical & Logical Storage)
Move cursor to desired item and press Enter.

  Logical Volume Manager
  File Systems
  Files & Directories
  Removable Disk Management  *1
  System Backup Manager
```

4. Select **Volume Groups**.

Example

```
                        Logical Volume Manager
Move cursor to desired item and press Enter.

  Volume Groups
  Logical Volumes
  Physical Volumes
  Paging Space
```

5. Select **Add a Volume Group**.

Example

```
                              Volume Groups
Move cursor to desired item and press Enter.

  List All Volume Groups
  Add a Volume Group
  Set Characteristics of a Volume Group
  List Contents of a Volume Group
  Remove a Volume Group
  Activate a Volume Group
  Deactivate a Volume Group
  Import a Volume Group
  Export a Volume Group
  Mirror a Volume Group  *1
  Unmirror a Volume Group  *1
  Synchronize LVM Mirrors  *1
  Back Up a Volume Group
  Remake a Volume Group
  List Files in a Volume Group Backup
  Restore Files in a Volume Group Backup
```

6. Enter or select values for the following fields:

   Volume Group name (the volume group can contain multiple hdisk devices)

   Physical partition size in megabytes, see “Physical partition size table” (page 65).

   Physical Volume names

   To enter values, place the cursor in the field and type the value.

   To select values, place the cursor in the field and press F4.

Example

```
Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                                [Entry Fields]
  VOLUME GROUP name                               [vg01]
  Physical partition SIZE in megabytes              4
  PHYSICAL VOLUME names                           [hdisk1]
  Activate volume group AUTOMATICALLY              yes
    at system restart?
  Volume Group MAJOR NUMBER                       []
```

7. Enter **yes** or **no** in the "Activate volume group AUTOMATICALLY at system restart?" field.

   If you are not using HACMP (High Availability Cluster Multi-Processing) or HAGEO (High Availability Geographic), enter **yes**.

   If you are using HACMP and/or HAGEO, enter **no**.

8. Press **Enter** when you have entered the values. The confirmation screen appears.

Example

```
ARE YOU SURE?

Continuing may delete information you may want
to keep. This is your last chance to stop
before continuing.

  Press Enter to continue.
  Press Cancel to return to the applications.
```

9. Press **Enter** again.

   The Command Status screen will appear. To ensure the devices have been assigned to a volume group, wait for **OK** to appear on the Command Status line.

Example

```
COMMAND STATUS

Command : OK          stdout : yes           stderr : no
Before command completion, additional instructions may appear below.

0516-796 mkvg : Making hdisk1 a physical volume. Please wait.
```

Repeat these steps for each volume group needed.

Creating the Journaled File Systems

Create the Journaled File Systems using the System Manager Information Tool (SMIT). This operation is not required when the volumes are used as raw devices. The largest file system permitted in AIX is 64 GB.

To create the Journaled File Systems:

1. Start SMIT.

Example

```
# smit -C
```

The System Management screen appears.

Example

```
                        System Management
Move cursor to desired item and press Enter.
  Software Installation and Maintenance
  Software License Management
  Devices
  System Storage Management (Physical & Logical Storage)
  Security & Users
Communications Applications and Services
  Print Spooling
  Problem Determination
  Performance & Resource Scheduling
  System Environments
  Processes & Subsystems
  Applications
  Using SMIT (information only)
```

2. Select **System Storage Management (Physical & Logical Storage)**.

Example

```
System Storage Management (Physical & Logical Storage)
Move cursor to desired item and press Enter.
    Logical Volume Manager
    File Systems
    Files & Directories
    Removable Disk Management  *1
    System Backup Manager
```

3. Select **File Systems**.

Example

```
File Systems
Move cursor to desired item and press Enter.
  List All File Systems
  List All Mounted File Systems
  Add / Change / Show / Delete File Systems
```

```
Mount a File System
Mount a Group of File Systems
Unmount a File System
Unmount a Group of File Systems
Verify a File System
Backup a File System
Restore a File System
```

4. Select **Add/Change/Show/Delete File Systems**.

Example

```
Add / Change / Show / Delete File Systems
Move cursor to desired item and press Enter.
  Journaled File Systems
  CDROM File Systems
  Network File System (NFS)
  Cache Fs  *1
```

5. Select **Journaled File Systems**.

Example

```
       Journaled File System
Move cursor to desired item and press Enter.
 Add a Journaled File System
 Add a Journaled File System on a Previously Defined
Logical Volume

 Change / Show Characteristics of a Journaled File System
 Remove a Journaled File System
 Defragment a Journaled File System
```

6. Select **Add a Journaled File System**.

Example

```
                Add a Journaled File System
Move cursor to desired item and press Enter.
  Add a Standard Journaled File System
  Add a Compressed Journaled File System
  Add a Large File Enabled Journaled File System
```

7. Select **Add a Standard Journaled File System**.

Example

```
                     Volume Group Name
Move cursor to desired item and press Enter.
  rootvg
  vg01
```

The Add a Journaled File System screen appears.

8. Select a volume group, and press **Enter**.

Example

```
Add a Journaled File System
Type or select values in entry fields.
Press Enter AFTER making all desired changes.
                                                [Entry Fields]
Volume group name                               vg01
SIZE of file system (in 512-byte blocks)        [4792320]
MOUNT POINT                                     [VG01]

  Mount AUTOMATICALLY at system restart?        no
  PERMISSIONS                                   read/write
  Mount OPTIONS                                 []
  Start Disk Accounting?                        no
  Fragment Size (bytes)                         4096
  Number of bytes per inode                     4096
  Compression algorithm                         no
  Allocation Group Size (Mbytes)  *1
```

9. Enter values for the following four fields:

   SIZE of file system (in 512-byte blocks): Enter the **lsvg** command to display the number of free physical partitions and physical partition size. Calculate the maximum size of the file system as follows: (FREE PPs - 1) x (PP SIZE) x 2048

   Mount Point: Enter mount point name. (Make a list of the mount point names for reference.)

   Mount AUTOMATICALLY at system restart?: Enter **yes**.

Caution *In high availability systems (HACMP and/or HAGEO), enter **no**.*

   Number of bytes per inode: Enter the number of bytes appropriate for the application, or use the default value.

10. Press **Enter** to create the Journaled File System.

    The Command Status screen appears.

11. To ensure that the Journaled File System has been created, wait for OK to appear on the Command Status line.

12. To continue creating Journaled File Systems, press the **F3** key until you return to the **Add a Journaled File System** screen. Repeat steps 2 through 11 for each Journaled File System to be created.

13. To exit SMIT, press the **F10** key.

Mounting and verifying the file systems

Mount the file systems and verify that the file systems were created correctly and are functioning properly.

To mount and verify the file systems:

1. Mount the file system. Enter:

   mount *mount_point_name*

Example

```
# mount /vg01
```

2. Repeat step 1 for each new file system.
3. Use the **df** command to verify the size of the file systems. The capacity is listed in 512-byte blocks. To list capacity in 1024-byte blocks, use the **df –k** command.

Example

```
# df
File system  512-blocks      free  %Used  Iused  %Iused  Mounted on
/dev/hd4           8192      3176    61%    652     31%  /
/dev/hd2        1024000    551448    46%   6997      5%  /usr
/dev/hd9var        8192      5512    32%     66      6%  /var
/dev/hd3          24576     11608    52%     38      0%  /tmp
/dev/hd1           8192      7840     4%     17      1%  /home
/dev/lv00       4792320   4602128     4%     16      1%  /VG00     (OPEN-3)
/dev/lv01       4792320   4602128     4%     16      1%  /VG01     (OPEN-3)
/dev/lv02      14401536  13949392     4%     16      1%  /VG02     (OPEN-9)
```

4. Verify that the file system is usable by performing some basic operations (for example, file creation, copying, and deletion) on each logical device.

Example

```
# cd /hp00
# cp /smit.log /hp00/smit.log.back1
# ls -l hp00
–rw-rw-rw-   1   root  system      375982 Nov 30 17:25 smit.log.back1
# cp smit.log.back1 smit.log.back2
# ls -l
-rw-rw-rw-   1   root  system      375982 Nov 30 17:25 smit.log.back1
-rw-rw-rw-   1   root  system      375982 Nov 30 17:28 smit.log.back2
# rm smit.log.back1
# rm smit.log.back2
```

5. Use the **df** command to verify that the file systems have successfully automounted after a reboot. Any file systems that were not automounted can be set to automount using the SMIT **Change a Journaled File System** screen.

   If you are using HACMP or HAGEO, do not set the file systems to automount.

Example

```
# df
File system  512-blocks      free  %Used  Iused  %Iused  Mounted on
/dev/hd4           8192      3176    61%    652     31%  /
/dev/hd2        1024000    551448    46%   6997      5%  /usr
/dev/hd9var        8192      5512    32%     66      6%  /var
/dev/hd3          24576     11608    52%     38      0%  /tmp
/dev/hd1           8192      7840     4%     17      1%  /home
/dev/lv00       4792320   4602128     4%     16      1%  /hp00
/dev/lv01       4792320   4602128     4%     16      1%  /hp01
/dev/lv02      14401536  13949392     4%     16      1%  /hp02
```

HACMP and HAGEO do not provide a complete disaster recovery or backup solution, and are not a replacement for standard disaster recovery planning and backup/recovery methodology.

2

Troubleshooting

If you encounter an error condition, see “Error conditions” on page 42 for recommended actions.

If you are unable to resolve an error condition, ask your HP support representative for assistance. See “Calling the HP support center” on page 44.

Error conditions

Error Condition	Recommended Action
The logical devices are not recognized by the host.	Verify that the READY indicator lights on the disk array are ON. Verify that fiber cables are correctly installed and firmly connected. Verify that the target IDs are properly configured. The LUNs for each TID must start at 0 and continue sequentially without skipping any numbers. Verify that the TIDs/WWNs on each bus are unique. Do not install two devices with the same ID on the same bus. Recheck the buses for new devices. Verify that LUSE devices are not intermixed with normal LUNs on the same port. Verify that the maximum number of LUSE devices per port has not been exceeded. Verify that the disk array Host Mode is set correctly.
The host does not reboot properly after hard shutdown.	If you power off the host without executing the shutdown process, wait three minutes to allow the disk array's internal timeout process to purge queued commands. If the host restarts while the disk array is processing queued commands, the host may not reboot successfully.
Physical volumes cannot be created.	Verify that the disk array logical devices are correctly formatted.
Logical volumes cannot be created.	Verify that the volume capacity for OPEN-x volumes is not greater than the maximum capacity allowed. See the Device Emulations Appendix. Verify that the capacity of the volume group is not less than the total capacity of the partitioned logical volume.

Error Condition	Recommended Action
A file system is not mounted after rebooting.	Verify that the host was restarted correctly. Verify that the file system attributes are correct.
The disk array performs a self reboot because the disk array was busy or it logged a panic message.	Reboot the host.
The disk array responds “Not Ready” or the disk array has displayed “Not Ready” and timed out.	Contact HP.
The host detects a parity error.	Check the HBA and make sure it was installed properly. Reboot the host.
The host hangs or devices are declared and the host hangs.	Make sure there are no duplicate disk array TIDs and that disk array TIDs do not conflict with any host TIDs.

Calling the HP support center

If you need to call HP customer support, provide as much information about the problem as possible, including the circumstances of the error or failure and the exact content of any error messages.

Depending on your system configuration, you may be able to view error messages as follows:

- View SIMs in Command View (Device Health tab).
- View R-SIMs in Remote Control XP, including reference codes and severity levels of recent R-SIMs.
- View SIMs that generate SNMP traps on the host.

A

Worksheets

Path worksheet

LDEV (CU:LDEV) (CU = control unit)	Device Type	SCSI Bus Number	Path 1	Alternate Paths		
0:00				TID: LUN:	TID: LUN:	TID: LUN:
0:01				TID: LUN:	TID: LUN:	TID: LUN:
0:02				TID: LUN:	TID: LUN:	TID: LUN:
0:03				TID: LUN:	TID: LUN:	TID: LUN:
0:04				TID: LUN:	TID: LUN:	TID: LUN:
0:05				TID: LUN:	TID: LUN:	TID: LUN:
0:06				TID: LUN:	TID: LUN:	TID: LUN:
0:07				TID: LUN:	TID: LUN:	TID: LUN:
0:08				TID: LUN:	TID: LUN:	TID: LUN:
0:09				TID: LUN:	TID: LUN:	TID: LUN:
0:10				TID: LUN:	TID: LUN:	TID: LUN:
0:11				TID: LUN:	TID: LUN:	TID: LUN:
0:12				TID: LUN:	TID: LUN:	TID: LUN:
0:13				TID: LUN:	TID: LUN:	TID: LUN:

Device data worksheet

Device File Name	Bus Number	LUN	TID	Device Type	Alternate Paths	
hdisk1					TID: LUN:	TID: LUN:
hdisk2					TID: LUN:	TID: LUN:
hdisk3					TID: LUN:	TID: LUN:
hdisk4					TID: LUN:	TID: LUN:
hdisk5					TID: LUN:	TID: LUN:
hdisk6					TID: LUN:	TID: LUN:
hdisk7					TID: LUN:	TID: LUN:
hdisk8					TID: LUN:	TID: LUN:
hdisk9					TID: LUN:	TID: LUN:
hdisk10					TID: LUN:	TID: LUN:
hdisk11					TID: LUN:	TID: LUN:
hdisk12					TID: LUN:	TID: LUN:
hdisk13					TID: LUN:	TID: LUN:
hdisk14					TID: LUN:	TID: LUN:

B

Disk array device emulations

This appendix provides information about disk array supported emulations and device type specifications. Some parameters may not be relevant to your array. Consult your HP representative for information about supported configurations for your system.

Supported emulations

XP Type	Emulation	OPEN-x	LUSE	CVS	LUSE & CVS
XP48 XP512	OPEN-3	Yes	Yes	Yes	Yes
	OPEN-8	Yes	Yes	Yes	Yes
	OPEN-9	Yes	Yes	Yes	Yes
	OPEN-E	Yes	Yes	Yes	Yes
	OPEN-K	Yes	Yes	Yes	Yes
	OPEN-L	Yes	Yes		
	OPEN-M	Yes	Yes		
	OPEN-V				
XP128 XP1024 XP12000	OPEN-3	Yes	Yes	Yes	Yes
	OPEN-8	Yes	Yes	Yes	Yes
	OPEN-9	Yes	Yes	Yes	Yes
	OPEN-E	Yes	Yes	Yes	Yes
	OPEN-K				
	OPEN-L	Yes	Yes		
	OPEN-M				
	OPEN-V	Yes	Yes		

Device type specifications

Device Type *(Note 1)*	Category *(Note 2)*	Blocks (512 bytes)	Sector Size (bytes)	# of Cylinders	Heads	Sectors per Track	Capacity MB* *(Note 3)*
OPEN-3	SCSI disk	4806720	512	3338	15	96	2347
OPEN-8	SCSI disk	14351040	512	9966	15	96	7007
OPEN-9	SCSI disk	14423040	512	10016	15	96	7042
OPEN-E	SCSI disk	28452960	512	19759	15	96	13893
OPEN-L	SCSI disk	71192160	512	49439	15	96	34761
OPEN-V	SCSI disk	max=125827200	512	Note 5	15	128	Note 6
LUSE							
OPEN-3*n	SCSI disk	4806720*n	512	3338*n	15	96	2347*n
OPEN-8*n	SCSI disk	14351040*n	512	9966*n	15	96	7007*n
OPEN-9*n	SCSI disk	14423040*n	512	10016*n	15	96	7042*n
OPEN-E*n	SCSI disk	28452960*n	512	19759*n	15	96	13893*n
OPEN-L*n	SCSI disk	71192160*n	512	49439*n	15	96	34761*n
OPEN-V*n	SCSI disk	max=125827200 Note 4	512	Note 5	15	128	Note 6
CVS							
OPEN-3 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
CVS LUSE							
OPEN-3*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-V*n	SCSI disk	Note 4	512	Note 5	15	128	Note 6

*Capacity = (512 x number of blocks) ÷ 1024^2

Note 1: The availability of a disk type depends on the disk array.

Note 2: The devices are defined to the host as SCSI disk devices, even though the interface is Fibre Channel.

Note 3 The device capacity can sometimes be changed by the BIOS or host adapter board. This may make actual capacity different from that listed in the table.

Note 4: The number of blocks for a CVS volume is calculated as follows:
# of blocks = (# of cylinders) × (# of heads) × (# of sectors per track)

Example 1: For an OPEN-3 CVS volume with capacity = 37 MB:
# of blocks = (53 cylinders–see Note 5) × (15 heads) × (96 sectors per track) = 76320

Example 2: For an OPEN-V CVS volume with capacity = 49 MB:
# of blocks = (53 cylinders–see Note 5) × (15 heads) × (128 sectors per track) = 101760

Note 5: The number of cylinders for a CVS volume is calculated as follows (↑ …↑ means that the value should be rounded up to the next integer):

OPEN-3/8/9/E: The number of cylinders for a CVS volume =
# of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑

Example: For an OPEN-3 CVS volume with capacity = 37 MB:
# of cylinders = ↑ 37 × 1024/720 ↑ = ↑ 52.62 ↑ (rounded up to next integer) = 53 cylinders

OPEN-V: The number of cylinders for a CVS volume =
# of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑

Example: For an OPEN-V CVS volume with capacity = 49 MB:
# of cylinders = ↑ 49 × 16/15 ↑ = ↑ 52.26 ↑ (rounded up to next integer) = 53 cylinders

OPEN-3/8/9/E: The number of cylinders for a CVS LUSE volume =
# of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑ × n

Example: For a CVS LUSE volume with capacity = 37 MB and n = 4
# of cylinders = ↑ 37 × 1024/720↑ × 4 = ↑ 52.62↑ × 4 = 53 × 4 = 212

OPEN-V: The number of cylinders for a CVS LUSE volume =
# of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑ × n

Example: For an OPEN-V CVS LUSE volume with capacity = 49 MB and n = 4
# of cylinders = ↑ 49 × 16/15↑ × 4 = ↑ 52.26↑ × 4 = 53 × 4 = 212

Note 6: The capacity of an OPEN-3/8/9/E CVS volume is specified in MB, not number of cylinders. The capacity of an OPEN-V CVS volume can be specified in MB or number of cylinders. You set the volume size using the LUN Configuration Manager or Command View software.

Disk parameters by emulation type

OPEN-3 parameters

Parameter		Emulation Type			
		OPEN-3	OPEN-3*n (n=2 to 36)	OPEN-3 CVS	OPEN-3 CVS*n (n=2 to 36)
ty	Disk category	Winchester	Winchester	Winchester	Winchester
dt	Control type	SCSI	SCSI	SCSI	SCSI
ns	Sectors/tracks	96	96	96	96
nt	Tracks/cylinder	15	15	15	15
nc	Number of all cylinders	3,338	3,338*n	Depends on configuration of CV[1]	Depends on configuration of CV[3]
rm	Number of rotations of the disk	6,300	6,300	6,300	6,300
oa	a partition offset (Starting block in a partition)	Set optionally	Set optionally	Set optionally	Set optionally
ob	b partition offset (Starting block in b partition)	Set optionally	Set optionally	Set optionally	Set optionally
oc	c partition offset (Starting block in c partition)	0	0	0	0
od	d partition offset (Starting block in d partition)	Set optionally	Set optionally	Set optionally	Set optionally
oe	e partition offset (Starting block in e partition)	Set optionally	Set optionally	Set optionally	Set optionally
of	f partition offset (Starting block in f partition)	Set optionally	Set optionally	Set optionally	Set optionally
og	g partition offset (Starting block in g partition)	Set optionally	Set optionally	Set optionally	Set optionally
oh	h partition offset (Starting block in h partition)	Set optionally	Set optionally	Set optionally	Set optionally
pa	a partition size	Set optionally[2]	Set optionally[2]	Set optionally[2]	Set optionally[2]
pb	b partition size	Set optionally	Set optionally	Set optionally	Set optionally

Parameter		Emulation Type			
		OPEN-3	OPEN-3*n (n=2 to 36)	OPEN-3 CVS	OPEN-3 CVS*n (n=2 to 36)
pc	c partition size	4,806,720	4,806,720*n	Depends on configuration of CV[1]	Depends on configuration of CV[3]
pd	d partition size	Set optionally	Set optionally	Set optionally	Set optionally
pe	e partition size	Set optionally	Set optionally	Set optionally	Set optionally
pf	f partition size	Set optionally	Set optionally	Set optionally	Set optionally
pg	g partition size	Set optionally	Set optionally	Set optionally	Set optionally
ph	h partition size	Set optionally	Set optionally	Set optionally	Set optionally
ba	a partition block size	8,192	8,192	8,192	8,192
bb	b partition block size	8,192	8,192	8,192	Set optionally
bc	c partition block size	8,192	8,192	8,192	8,192
bd	d partition block size	8,192	8,192	8,192	8,192
be	e partition block size	8,192	8,192	8,192	8,192
bf	f partition block size	8,192	8,192	8,192	8,192
bg	g partition block size	8,192	8,192	8,192	8,192
bh	h partition block size	8,192	8,192	8,192	8,192
fa	a partition fragment size	1,024	1,024	1,024	1,024

(continued)

fb	b partition fragment size	1,024	1,024	1,024	1,024
fc	c partition fragment size	1,024	1,024	1,024	1,024
fd	d partition fragment size	1,024	1,024	1,024	1,024
fe	e partition fragment size	1,024	1,024	1,024	Set optionally
ff	f partition fragment size	1,024	1,024	1,024	1,024
fg	g partition fragment size	1,024	1,024	1,024	1,024
fh	h partition fragment size	1,024	1,024	1,024	1,024

See “Notes for disk parameters” (page 62).

OPEN-8 parameters

Parameter		Emulation Type			
		OPEN-8	OPEN-8*n (n=2 to 36)	OPEN-8 CVS	OPEN-8 CVS*n (n=2 to 36)
ty	Disk category	Winchester	Winchester	Winchester	Winchester
dt	Control type	SCSI	SCSI	SCSI	SCSI
ns	Sectors/tracks	96	96	96	116
nt	Tracks/cylinder	15	15	15	Set optionally
nc	Number of all cylinders	9,966	9,966*n	Depends on configuration of CV[1]	Depends on configuration of CV[1]
rm	Number of rotations of the disk	6,300	6,300	6,300	6,300
oa	a partition offset (Starting block in a partition)	Set optionally	Set optionally	Set optionally	Set optionally
ob	b partition offset (Starting block in b partition)	Set optionally	Set optionally	Set optionally	Set optionally
oc	c partition offset (Starting block in c partition)	0	0	0	0
od	d partition offset (Starting block in d partition)	Set optionally	Set optionally	Set optionally	Set optionally
oe	e partition offset (Starting block in e partition)	Set optionally	Set optionally	Set optionally	Set optionally
of	f partition offset (Starting block in f partition)	Set optionally	Set optionally	Set optionally	Set optionally
og	g partition offset (Starting block in g partition)	Set optionally	Set optionally	Set optionally	Set optionally
oh	h partition offset (Starting block in h partition)	Set optionally	Set optionally	Set optionally	Set optionally
pa	a partition size	Set optionally[2]	Set optionally[2]	Set optionally[2]	Set optionally[2]
pb	b partition size	Set optionally	Set optionally	Set optionally	Set optionally

Parameter		Emulation Type			
		OPEN-8	OPEN-8*n (n=2 to 36)	OPEN-8 CVS	OPEN-8 CVS*n (n=2 to 36)
pc	c partition size	14,351,040	14,351,040*n	Depends on configuration of CV[1]	Depends on configuration of CV[1]
pd	d partition size	Set optionally	Set optionally	Set optionally	Set optionally
pe	e partition size	Set optionally	Set optionally	Set optionally	Set optionally
pf	f partition size	Set optionally	Set optionally	Set optionally	Set optionally
pg	g partition size	Set optionally	Set optionally	Set optionally	Set optionally
ph	h partition size	Set optionally	Set optionally	Set optionally	Set optionally
ba	a partition block size	8,192	8,192	8,192	8,192
bb	b partition block size	8,192	8,192	8,192	8,192
bc	c partition block size	8,192	8,192	8,192	8,192
bd	d partition block size	8,192	8,192	8,192	8,192
be	e partition block size	8,192	8,192	8,192	8,192
bf	f partition block size	8,192	8,192	8,192	Set optionally
bg	g partition block size	8,192	8,192	8,192	Set optionally
bh	h partition block size	8,192	8,192	8,192	8,192
fa	a partition fragment size	1,024	1,024	1,024	1,024
fb	b partition fragment size	1,024	1,024	1,024	1,024
fc	c partition fragment size	1,024	1,024	1,024	1,024
fd	d partition fragment size	1,024	1,024	1,024	1,024
fe	e partition fragment size	1,024	1,024	1,024	1,024
ff	f partition fragment size	1,024	1,024	1,024	1,024
fg	g partition fragment size	1,024	1,024	1,024	1,024
fh	h partition fragment size	1,024	1,024	1,024	1,024

See “Notes for disk parameters” (page 62).

OPEN-9 parameters

Parameter		Emulation Type			
		OPEN-9	OPEN-9*n (n=2 to 36)	OPEN-9 CVS	OPEN-9 CVS*n (n=2 to 36)
ty	Disk category	Winchester	Winchester	Winchester	Winchester
dt	Control type	SCSI	SCSI	SCSI	SCSI
ns	Sectors/tracks	96	96	96	96
nt	Tracks/cylinder	15	15	15	15
nc	Number of all cylinders	10,016	10,016*n	Depends on configuration of CV[1]	Depends on configuration of CV[3]
rm	Number of rotations of the disk	6,300	6,300	6,300	6,300
oa	a partition offset (Starting block in a partition)	Set optionally	Set optionally	Set optionally	Set optionally
ob	b partition offset (Starting block in b partition)	Set optionally	Set optionally	Set optionally	Set optionally
oc	c partition offset (Starting block in c partition)	0	0	0	0
od	d partition offset (Starting block in d partition)	Set optionally	Set optionally	Set optionally	Set optionally
oe	e partition offset (Starting block in e partition)	Set optionally	Set optionally	Set optionally	Set optionally
of	f partition offset (Starting block in f partition)	Set optionally	Set optionally	Set optionally	Set optionally
og	g partition offset (Starting block in g partition)	Set optionally	Set optionally	Set optionally	Set optionally
oh	h partition offset (Starting block in h partition)	Set optionally	Set optionally	Set optionally	Set optionally
pa	a partition size	Set optionally[2]	Set optionally[2]	Set optionally[2]	Set optionally[2]
pb	b partition size	Set optionally	Set optionally	Set optionally	Set optionally

Parameter		Emulation Type			
		OPEN-9	OPEN-9*n (n=2 to 36)	OPEN-9 CVS	OPEN-9 CVS*n (n=2 to 36)
pc	c partition size	14,423,040	14,423,040*n	Depends on configuration of CV[1]	Depends on configuration of CV[3]
pd	d partition size	Set optionally	Set optionally	Set optionally	Set optionally
pe	e partition size	Set optionally	Set optionally	Set optionally	Set optionally
pf	f partition size	Set optionally	Set optionally	Set optionally	Set optionally
pg	g partition size	Set optionally	Set optionally	Set optionally	Set optionally
ph	h partition size	Set optionally	Set optionally	Set optionally	Set optionally
ba	a partition block size	8,192	8,192	8,192	8,192
bb	b partition block size	8,192	8,192	8,192	8,192
bc	c partition block size	8,192	8,192	8,192	8,192
bd	d partition block size	8,192	8,192	8,192	8,192
be	e partition block size	8,192	8,192	8,192	8,192
bf	f partition block size	8,192	8,192	8,192	8,192
bg	g partition block size	8,192	8,192	8,192	8,192
bh	h partition block size	8,192	8,192	8,192	8,192
fa	a partition fragment size	1,024	1,024	1,024	1,024
fb	b partition fragment size	1,024	1,024	1,024	1,024
fc	c partition fragment size	1,024	1,024	1,024	1,024
fd	d partition fragment size	1,024	1,024	1,024	1,024
fe	e partition fragment size	1,024	1,024	1,024	1,024
ff	f partition fragment size	1,024	1,024	1,024	1,024
fg	g partition fragment size	1,024	1,024	1,024	1,024
fh	h partition fragment size	1,024	1,024	1,024	1,024

See “Notes for disk parameters” (page 62).

OPEN-E parameters

Parameter		Emulation Type			
		OPEN-E	OPEN-E*n (n=2 to 36)	OPEN-E CVS	OPEN-E CVS*n (n=2 to 36)
ty	Disk category	Winchester	Winchester	Winchester	Winchester
dt	Control type	SCSI	SCSI	SCSI	SCSI
ns	Sectors/tracks	96	96	96	116
nt	Tracks/cylinder	15	15	15	15
nc	Number of all cylinders	19,759	19,759*n	Depends on configuration of CV[1]	Depends on configuration of CV[3]
rm	Number of rotations of the disk	6,300	6,300	6,300	6,300
oa	a partition offset (Starting block in a partition)	Set optionally	Set optionally	Set optionally	Set optionally
ob	b partition offset (Starting block in b partition)	Set optionally	Set optionally	Set optionally	Set optionally
oc	c partition offset (Starting block in c partition)	0	0	0	0
od	d partition offset (Starting block in d partition)	Set optionally	Set optionally	Set optionally	Set optionally
oe	e partition offset (Starting block in e partition)	Set optionally	Set optionally	Set optionally	Set optionally
of	f partition offset (Starting block in f partition)	Set optionally	Set optionally	Set optionally	Set optionally
og	g partition offset (Starting block in g partition)	Set optionally	Set optionally	Set optionally	Set optionally
oh	h partition offset (Starting block in h partition)	Set optionally	Set optionally	Set optionally	Set optionally
pa	a partition size	Set optionally[2]	Set optionally[2]	Set optionally[2]	Set optionally[2]
pb	b partition size	Set optionally	Set optionally	Set optionally	Set optionally
pc	c partition size	28,452,960	28,452,960*n	Depends on configuration of CV[1]	Depends on configuration of CV[3]

Parameter		Emulation Type			
		OPEN-E	OPEN-E*n (n=2 to 36)	OPEN-E CVS	OPEN-E CVS*n (n=2 to 36)
pd	d partition size	Set optionally	Set optionally	Set optionally	Set optionally
pe	e partition size	Set optionally	Set optionally	Set optionally	Set optionally
pf	f partition size	Set optionally	Set optionally	Set optionally	Set optionally
pg	g partition size	Set optionally	Set optionally	Set optionally	Set optionally
ph	h partition size	Set optionally	Set optionally	Set optionally	Set optionally
ba	a partition block size	8,192	8,192	8,192	8,192
bb	b partition block size	8,192	8,192	8,192	8,192
bc	c partition block size	8,192	8,192	8,192	8,192
bd	d partition block size	8,192	8,192	8,192	8,192
be	e partition block size	8,192	8,192	8,192	8,192
bf	f partition block size	8,192	8,192	8,192	8,192
bg	g partition block size	8,192	8,192	8,192	8,192
bh	h partition block size	8,192	8,192	8,192	8,192
fa	a partition fragment size	1,024	1,024	1,024	1,024
fb	b partition fragment size	1,024	1,024	1,024	1,024
fc	c partition fragment size	1,024	1,024	1,024	1,024
fd	d partition fragment size	1,024	1,024	1,024	1,024
fe	e partition fragment size	1,024	1,024	1,024	1024
ff	f partition fragment size	1,024	1,024	1,024	1,024
fg	g partition fragment size	1,024	1,024	1,024	1,024
fh	h partition fragment size	1,024	1,024	1,024	1,024

See “Notes for disk parameters” (page 62).

Notes for disk parameters

1. The value of pc is calculated as follows:

   pc = nc ∗ nt ∗ ns

   The nc of OPEN-x CVS corresponds to the capacity specified by SVP or remote console.

   The CVS size of OPEN-x is specified by capacity (megabyte), not by number of cylinders.

   The number of cylinders of an OPEN-x CVS volume can be obtained by the following calculation (↑ ↑ means round up to integer).

   The number of cylinders = ↑ (specified capacity in megabytes from SVP or remote console) × 1,024 / 720 ↑ .

Example When 37 MB is specified for an OPEN-3 CVS volume from SVP, the number of cylinders of the OPEN-3 CVS can be calculated as follows:

37 × 1,024 / 720 = 52.62

↑ 52.62↑ = 53

The OPEN-3 CVS volume has 53 cylinders.

2. The value of pa must be equal to or more than 131,072.
3. The number of cylinders of a Logical Unit Size Expansion (LUSE) composed of OPEN-x CVS volumes corresponds to the capacity specified by the SVP or the remote console. CVS size of OPEN-x is specified by the capacity (megabytes), not by the number of cylinders. The number of cylinders of the OPEN-x CVS volume can be obtained by the following calculation (↑ ↑ means round up to integer):

   The number of cylinders = ↑ (specified capacity in megabytes from SVP or remote console) × 1,024 / 720 ↑ × *n*

   where *n* is the number of concatenated volumes for LUSE.

Example

When 37 MB is specified for the OPEN-3 CVS volume and the four volumes are concatenated, the number of cylinders of the OPEN-3 CVS can be calculated as follows:

$$\uparrow 37 \times 1{,}024 / 720 \uparrow \times 4 = \uparrow 52.62 \uparrow \times 4 = 53 \times 4 = 212$$

The LUSE for the OPEN-3 CVS volume has 212 cylinders.

Byte information table

Values in this table assume that large files are stored in large volumes, and the maximum number of files stored in each device type is approximately the same for each device type.

Category	LU Product Name	Number of Bytes per Inode
OPEN-3	OPEN-3 OPEN-3*2 to OPEN-3*28	4096
	OPEN-3*29 to OPEN-3*36	8192
OPEN-8	OPEN-8 OPEN-8*2 to OPEN-8*9	4096
	OPEN-8*10 to OPEN-8*18	8192
	OPEN-8*19 to OPEN-8*36	16384
OPEN-9	OPEN-9 OPEN-9*2 to OPEN-9*9	4096
	OPEN-9*10 to OPEN-9*18	8192
	OPEN-9*19 to OPEN-9*36	16384
OPEN-3/8/9 CVS	OPEN-3 CVS OPEN-8 CVS OPEN-9 CVS OPEN-E CVS OPEN-K CVS	4096
OPEN-3/8/9*n CVS	35 to 64800	4096
	64801 to 126000	8192
	126001 and higher	16384
OPEN-E	OPEN-E OPEN-E*2-OPEN-E*4	4096
	OPEN-E*5 to OPEN-E*9	8192
	OPEN-E*10 to OPEN-E*18	16384
OPEN-L	OPEN-L	4096
	OPEN-L*2 to OPEN-L*3	8192
	OPEN-L*4 to OPEN-L*7	16384
OPEN-x CVS	OPEN-3 CVS, OPEN-9 CVS, OPEN-E CVS, OPEN-V CVS	4096

Physical partition size table

Category	LU Product Name	Physical Partition Size in Megabytes
OPEN-3	OPEN-3	4
	OPEN-3*2 to OPEN-3*3	8
	OPEN-3*4 to OPEN-3*6	16
	OPEN-3*7 to OPEN-3*13	32
	OPEN-3*14 to OPEN-3*27	64
	OPEN-3*28 to OPEN-3*36	128
OPEN-8	OPEN-8	8
	OPEN-8*2	16
	OPEN-8*3 to OPEN-8*4	32
	OPEN-8*5 to OPEN-8*9	64
	OPEN-8*10 to OPEN-8*18	128
	OPEN-8*19 to OPEN-8*36	256
OPEN-9	OPEN-9	8
	OPEN-9*2	16
	OPEN-9*3 to OPEN-9*4	32
	OPEN-9*5 to OPEN-9*9	64
	OPEN-9*10 to OPEN-9*18	128
	OPEN-9*19 to OPEN-9*36	256
OPEN-E	OPEN-E	16
	OPEN-E*2	32
	OPEN-E*3 to OPEN-E*4	64
	OPEN-E*5 to OPEN-E*9	128
	OPEN-E*10 to OPEN-E*18	256

Category	LU Product Name	Physical Partition Size in Megabytes
OPEN-L	OPEN-L	64
	OPEN-L*2 to OPEN-L*3	128
	OPEN-L*4 to OPEN-L*7	256
OPEN-x*n CVS	35 to1800	2
	1801 to 2300	4
	2301 to 7000	8
	7001 to 16200	16
	13201 to 32400	32
	32401 to 64800	64
	64801 to 126000	128
	126001 to 259200	256
	259201 - 518400	512
	518401 and higher	1024

Glossary

AL	Arbitrated loop.
AL-PA	Arbitrated loop physical address.
BC	HP StorageWorks Business Copy XP. BC lets you maintain up to nine local copies of logical volumes on the disk array.
CA	HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of local logical volumes on a remote disk array.
Command View	HP StorageWorks Command View XP, a software product for managing XP arrays. Command View runs on a Windows-based management workstation.
command device	An LDEV that transfers RAID commands to BC or CA logical volumes.
CVS	CVS devices (OPEN-x CVS) are custom volumes that are smaller than normal fixed-sized logical disk devices (volumes).
DKC (disk controller unit)	The array cabinet that houses the channel adapters and service processor (SVP).
DKU (disk cabinet unit)	The array cabinets that house the disk array physical disks.
emulation modes	Emulation modes can be assigned to LDEVs to make them operate like standard OPEN system disk drives. The emulation mode of an LDEV determines its capacity. Refer to the appendices for device capacities.
FC	Fibre Channel.
FC-AL	Fibre Channel arbitrated loop.
FCP	Fibre Channel Protocol.

HBA	Host bus adapter.
HP	Hewlett-Packard Company.
LDEV	Logical device. An LDEV is created when a RAID group is divided into sections using a selected host emulation mode (for example, OPEN-9 or OPEN-M). The number of resulting LDEVs depends on the emulation mode. “LDEV” and “volume” are synonyms.
LUN	Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.
LUSE	Logical Unit Size Expansion, a feature which logically combines LDEVs so they appear as a larger LDEV. This allows a LUN to be associated with 2 to 36 LDEVs. LUSE allows applications to access data requiring large amounts of disk space.
OFC	Open Fibre Control.
OPEN-*x*	A general term describing any one of the supported OPEN emulation modes (for example, OPEN-L).
OS	Operating system.
PA	Physical address.
path	“Path” and “LUN” are synonymous. Paths are created by associating a port, a target, and a LUN ID with one or more LDEVs.
port	A connector on a channel adapter card in the disk array. A port passes data between the disk array and external devices, such as a host server. Ports are named using a port group and port letter, for example, CL1-A.
RAID	Redundant array of independent disks.
remote console PC	The PC running HP StorageWorks Remote Control XP.
Remote Control (RC)	HP StorageWorks Remote Control XP. A software product used for managing XP arrays.
R-SIM	Remote service information message.

SCSI	Small computer system interface.
SIM	Service information message.
SNMP	Simple Network Management Protocol.
SVP	Service processor. A notebook computer built into the disk array. The SVP provides a direct interface to the disk array and is used only by the HP service representative.
TID	Target ID.
VSC	Volume Size Configuration is a feature that defines custom volumes (CVS volumes) that are smaller than normal fixed-sized logical disk devices (volumes).
WWN	World Wide Name. A unique identifier assigned to a Fibre Channel device.

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